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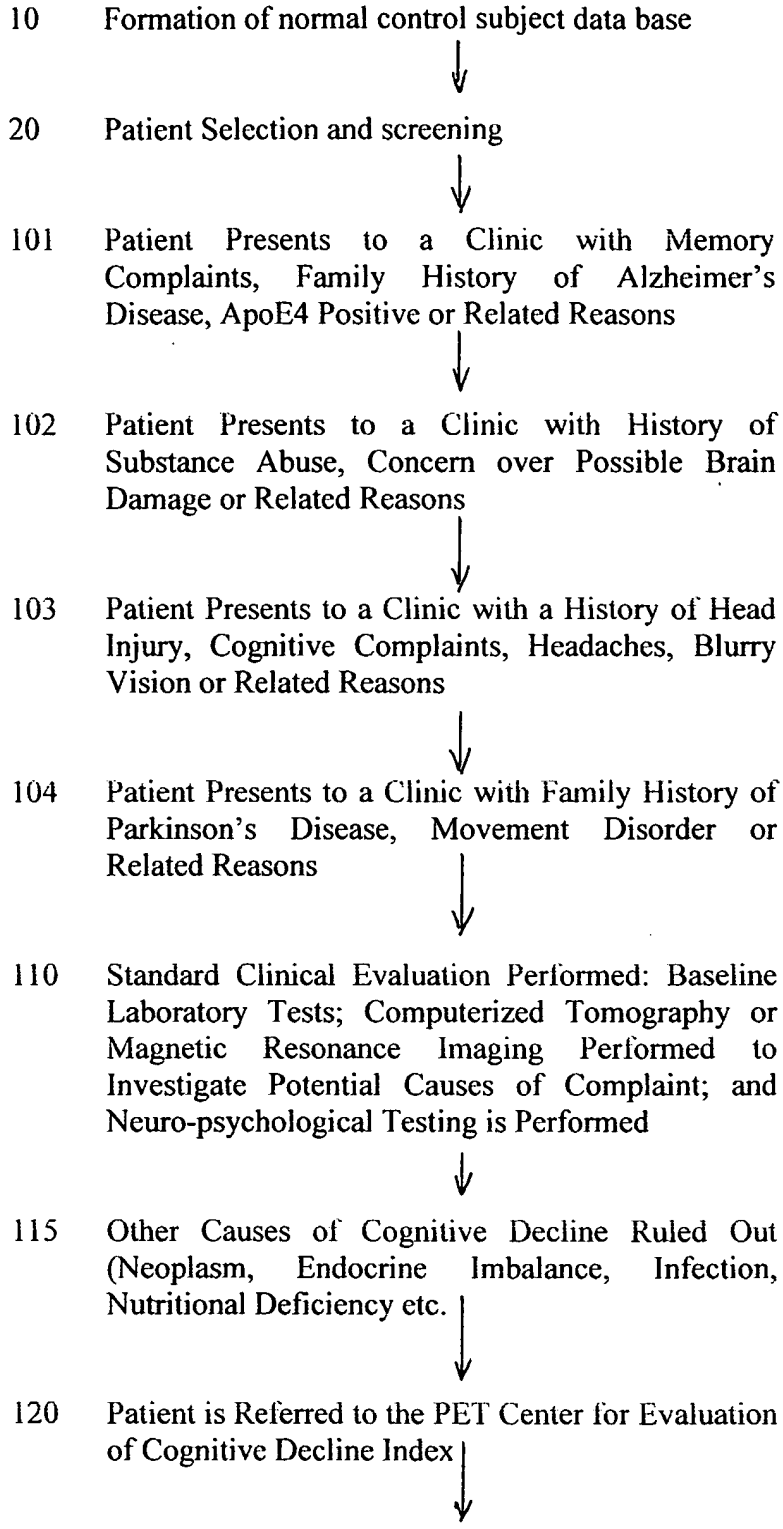


FIG. 1 Normal Subject Controls and Patient Selection for Development of the Cognitive Decline Index

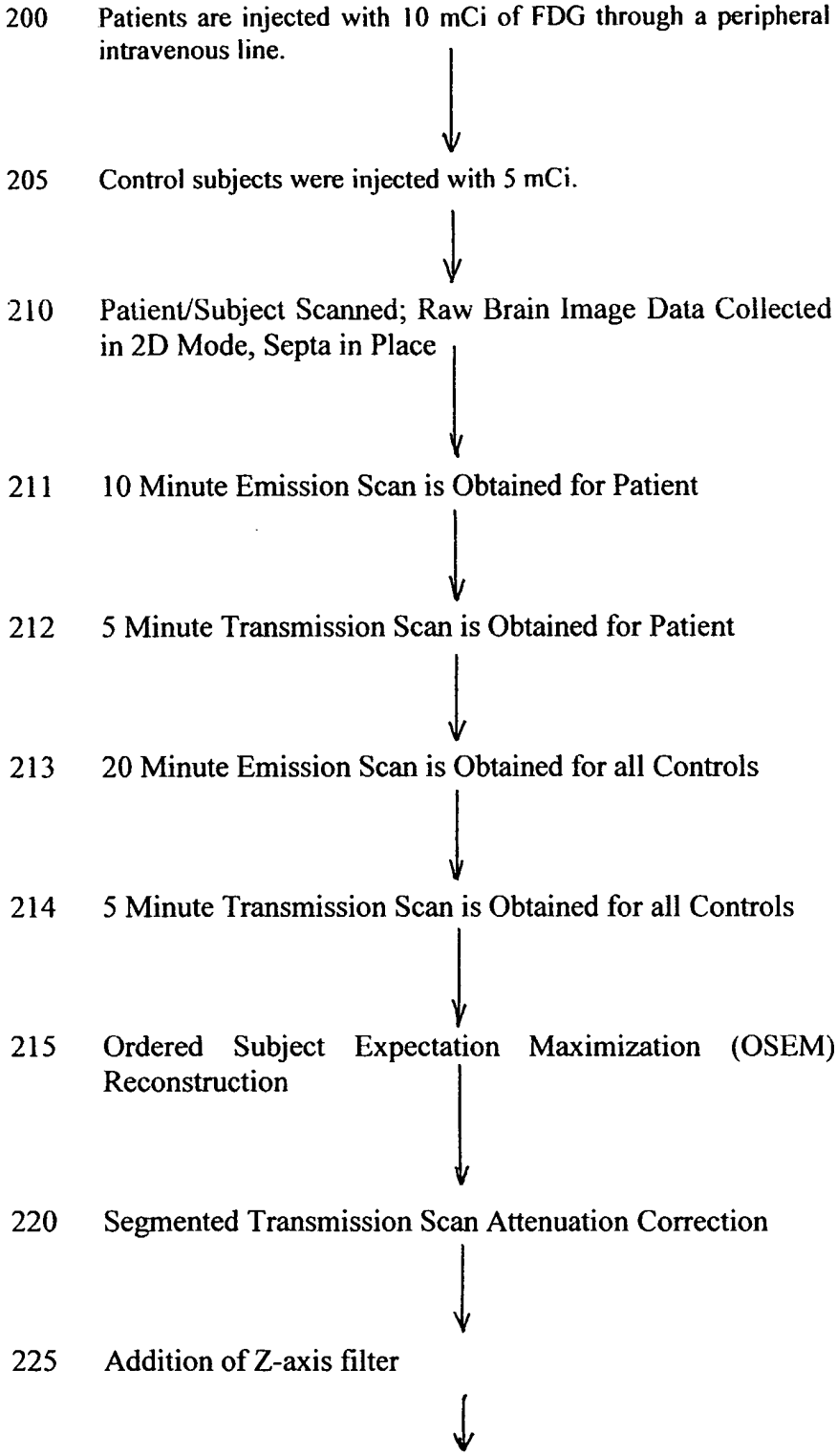


FIG. 2a Derivation of the Processed Digital Brain Image

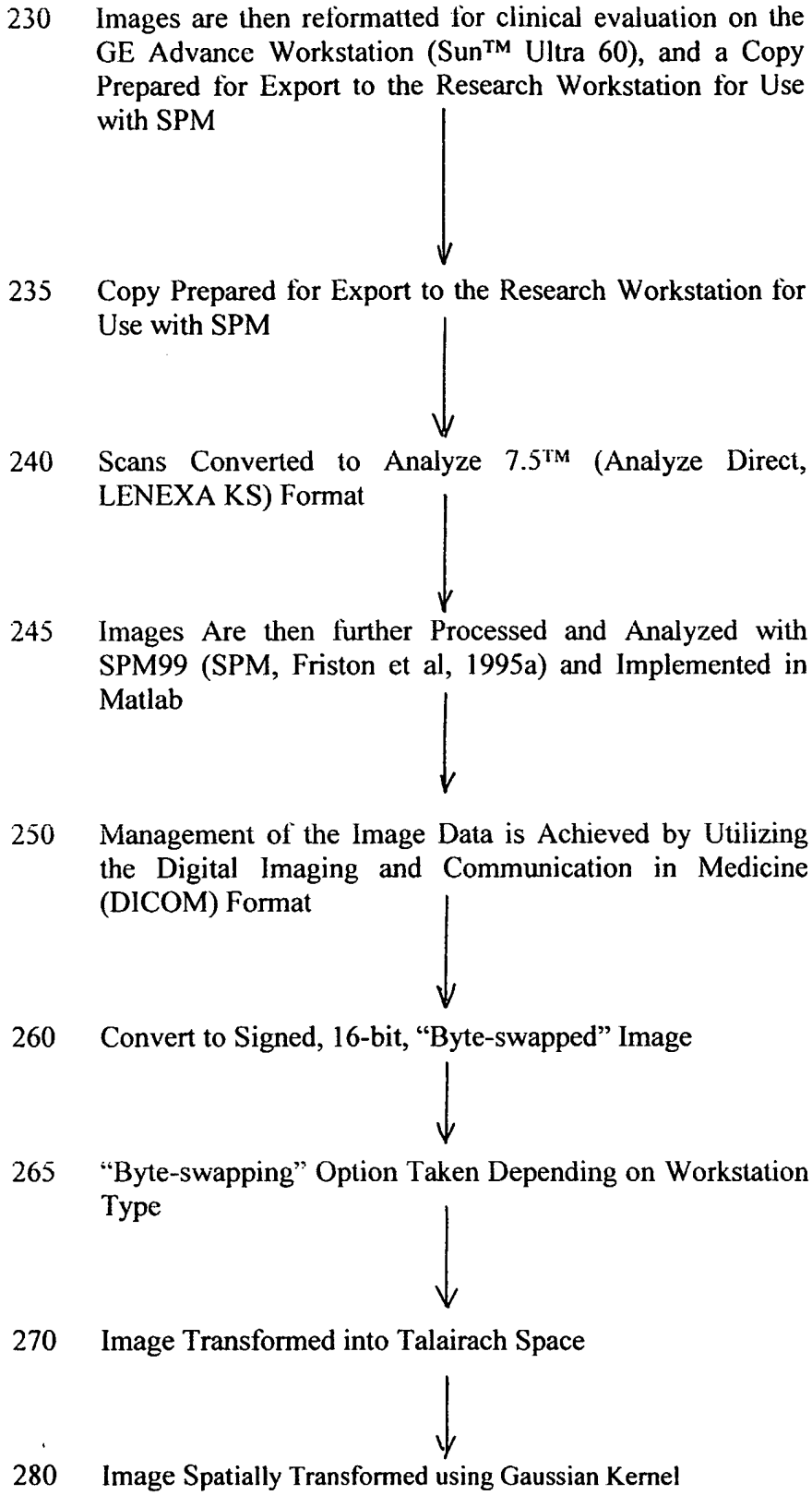


FIG. 2a (Cont'd) Derivation of the Processed Digital Brain Image

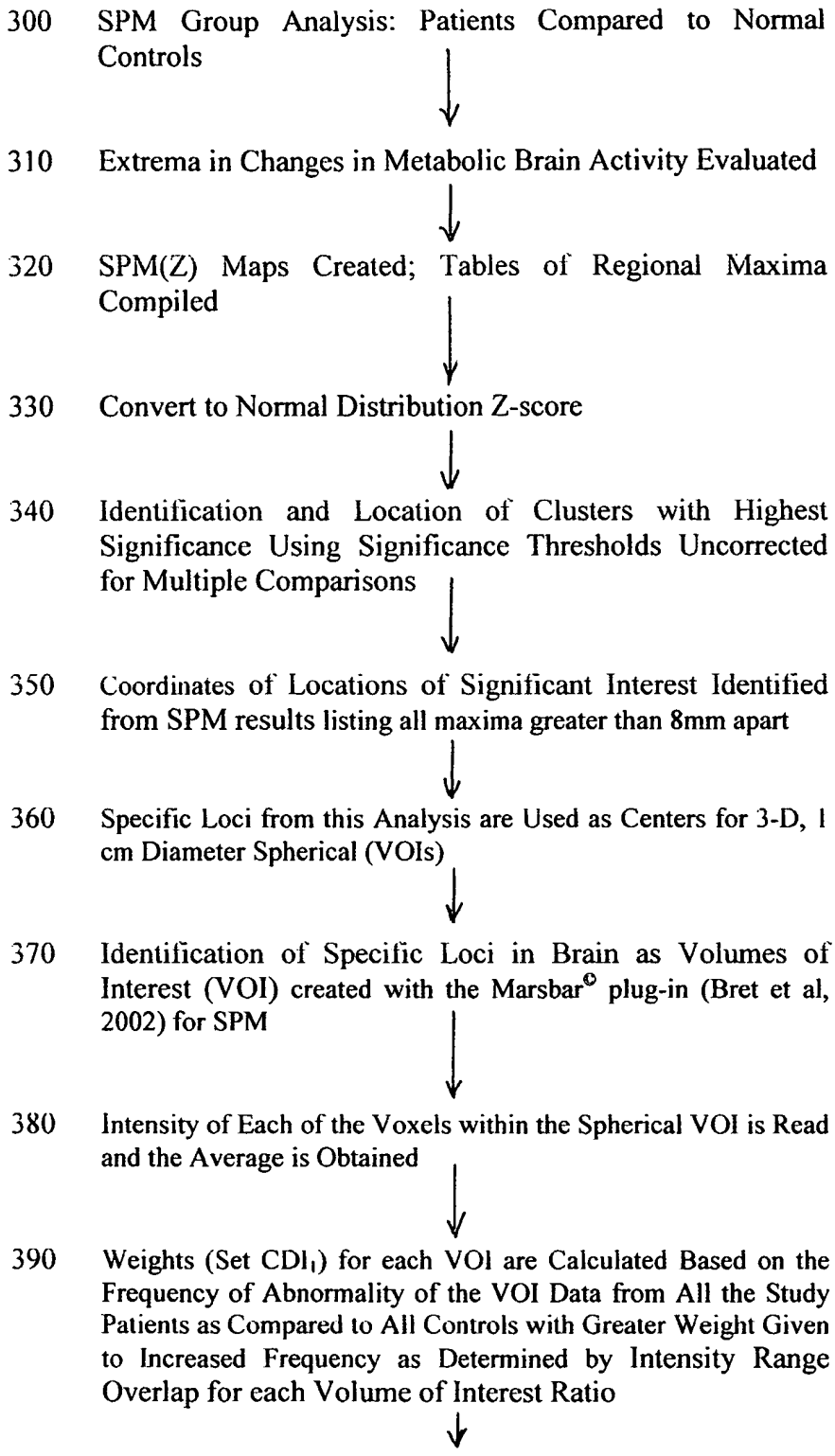


FIG. 2b Derivation of Region Location and Identification of VOIs

391 Import VOI Data Into Spreadsheet

↓

392 Determine Intensity Range Overlap for each VOI Ratio

↓

393 Create Weights for each Intensity Extreme

↓

394 Create Weighted VOI Ratio

↓

395 Scale and Normalize Ratio

↓

400 Calculation of CDI:

$$CDI = C_x + \left[\sum_{j=1}^{n} V_j X_j / n \right] / \left[\sum_{i=1}^{m} W_i Y_i / m \right]$$

Where X_j denotes the j^{th} Increased Intensity Value;

V_j denotes the j^{th} Weight for the j^{th} Increased Intensity Value;

Y_i denotes the i^{th} Decreased Intensity Value; and

W_i denotes the i^{th} Weight for the i^{th} Decreased Intensity Value.

C_x is the correction factor used to normalize the dataset.

↓

410 Weights of Set CDI_1 are then used as a baseline for calculation of a second set of Weights (Set CDI_2) to calculate CDI_2. Set CDI_2 is calculated by iterative optimization of each weight to maximally separate the patient from the controls

FIG. 2b (Cont'd) Derivation of Region Location and Identification of VOIs

500 CDI is Compared to Established Normal Range of Values; Presence of Normality or Abnormality is Determined

510 If CDI Reading is Negative, Patient Educated About the Clinical Course of Potential Illnesses and Signs to Watch out for; Potential Benefit of Preventative Measures such as Antioxidants, Brain Exercises, Beneficial Diet and Adequate Rest are Discussed

520 If CDI Reading is Positive, Patient Educated about the Meaning of a Positive CDI Reading, Projected Clinical Course of Illness, Benefit of Medication, Potential Benefit of Preventative Measures such as Antioxidants, Brain Exercises, Beneficial Diet and Adequate Rest are Discussed

530 Following either Step 620 or Step 630, Results are Given to Referring Physician and Patient Scheduled for Re-evaluation in one year.

540 Patient Data is Stored in the Comprehensive Patient Database

FIG. 2c Patient Diagnosis and Clinical Recommendations

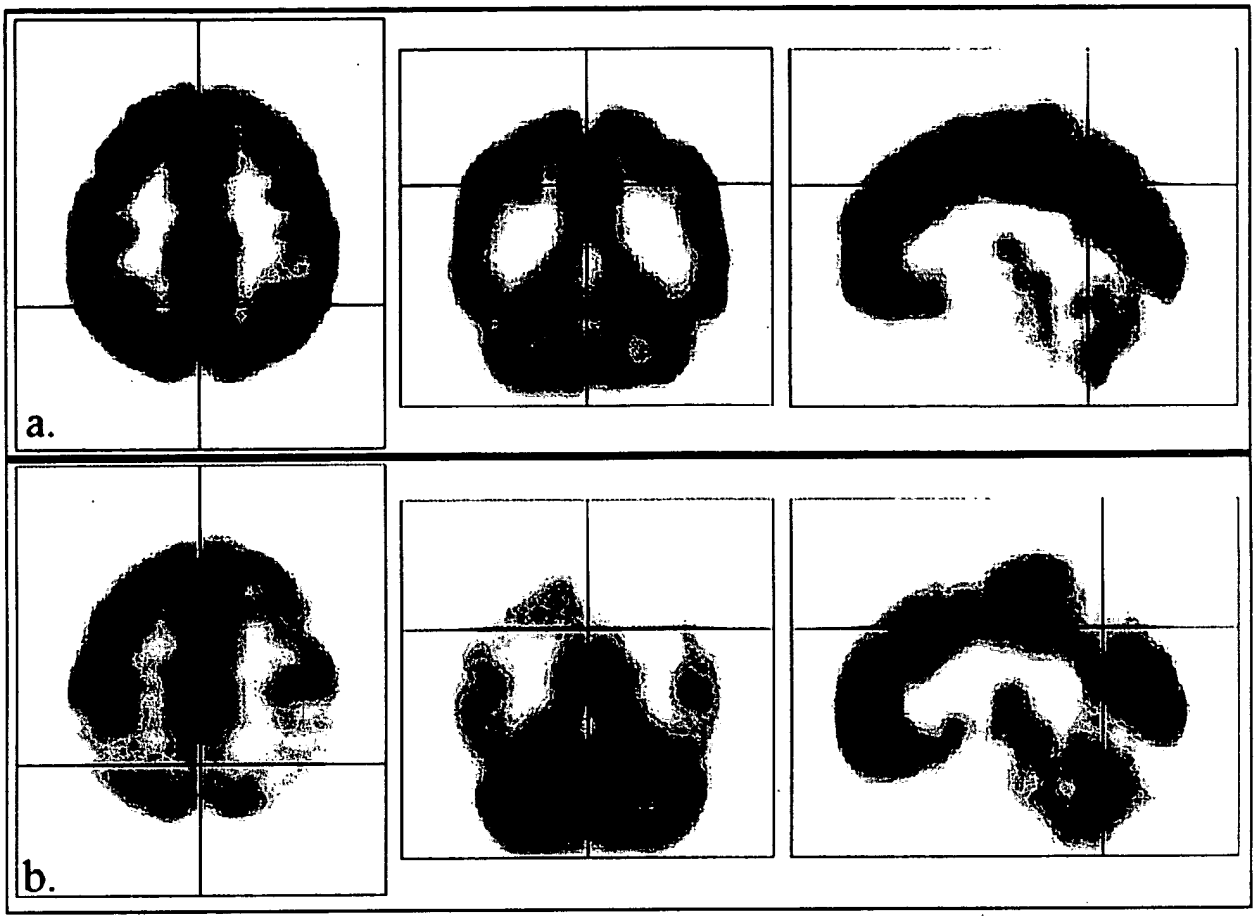
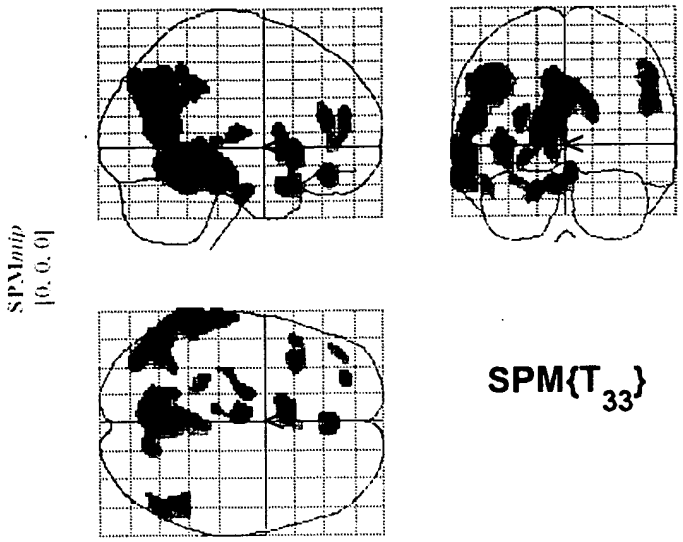
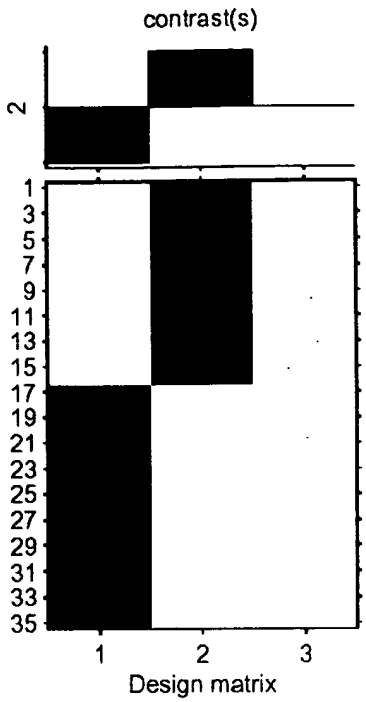


Fig. 3





SPMresults: Results_122802_MCIvsOldctrls
Height threshold T = 2.50
Extent threshold k = 50 voxels

Statistics: *volume summary (p-values corrected for entire volume)*

set-level		cluster-level			voxel-level				x,y,z {mm}
p	c	$p_{corrected}$	k_E	$p_{uncorrected}$	$p_{corrected}$	T	(Z)	$p_{uncorrected}$	
0.173	14	0.000	1945	0.000	0.106	5.29	(4.47)	0.000	-4 -70 30
					0.483	4.54	(3.97)	0.000	-14 -68 16
					0.616	4.37	(3.86)	0.000	-4 -58 28
		0.000	2610	0.000	0.788	4.16	(3.70)	0.000	-42 -74 36
					0.804	4.13	(3.68)	0.000	-56 -56 16
					0.881	4.01	(3.59)	0.000	-60 -56 -8
		0.862	202	0.064	0.883	4.01	(3.59)	0.000	-6 14 -24
		0.247	450	0.009	0.951	3.84	(3.47)	0.000	52 -64 38
					1.000	2.96	(2.77)	0.003	54 -50 44
		1.000	58	0.302	0.998	3.49	(3.20)	0.001	-48 18 -22
		0.991	114	0.153	0.998	3.48	(3.19)	0.001	-4 -12 10
					1.000	2.81	(2.64)	0.004	-8 -30 4
		0.996	101	0.177	0.999	3.43	(3.15)	0.001	4 38 -16
		0.944	162	0.093	1.000	3.37	(3.10)	0.001	-10 14 -2
					1.000	2.90	(2.71)	0.003	-12 8 12
		0.981	131	0.127	1.000	3.32	(3.07)	0.001	-20 -14 -28
					1.000	2.91	(2.72)	0.003	-30 -22 -20
		0.888	191	0.071	1.000	3.22	(2.98)	0.001	-38 20 -2
		0.997	95	0.189	1.000	3.21	(2.97)	0.001	-26 48 16
		0.993	110	0.160	1.000	3.05	(2.84)	0.002	-2 36 18
					1.000	2.69	(2.54)	0.006	-2 42 2
		1.000	69	0.261	1.000	3.00	(2.80)	0.003	-24 -38 -6
		1.000	50	0.338	1.000	2.93	(2.74)	0.003	-40 46 6

table shows at most local maxima > 8.0mm apart per cluster

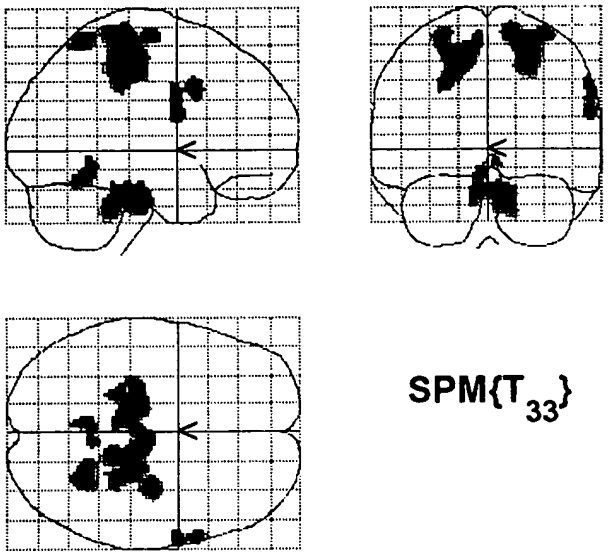
Height threshold: T = 2.50, p = 0.009 (1.000 corrected)
Extent threshold: k = 50 voxels, p = 0.338 (1.000 corrected)
Expected voxels per cluster, <k> = 58.849
Expected number of clusters, <c> = 10.48
Degrees of freedom = [1.0, 33.0]
Smoothness FWHM = 13.5 13.7 16.0 {mm} = 6.7 6.9 8.0 {voxels}
Search volume: S = 1815544 mm^3 = 226943 voxels = 559.8 resels
Voxel size: [2.0, 2.0, 2.0] mm (1 resel = 370.95 voxels)

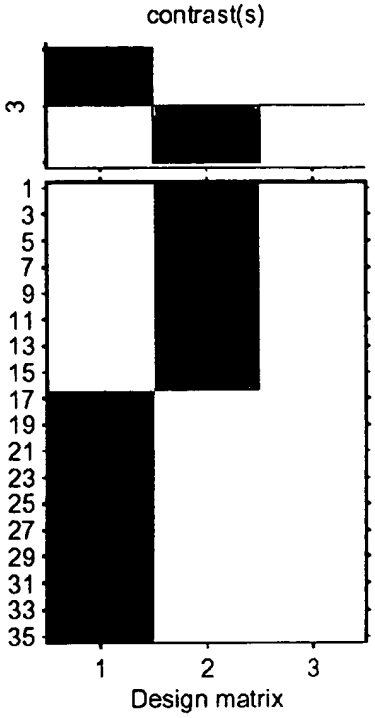
Statistics: *single cluster summary (p-values corrected for entire volume)*

cluster-level			voxel-level				x,y,z {mm}
$p_{corrected}$	k_E	$p_{uncorrected}$	$p_{corrected}$	T	(Z)	$p_{uncorrected}$	
0.000	2610	0.000	0.788	4.16	(3.70)	0.000	-42 -74 36
			0.804	4.13	(3.68)	0.000	-56 -56 16
			0.881	4.01	(3.59)	0.000	-60 -56 -8
			0.892	3.99	(3.58)	0.000	-62 -36 -6
			0.905	3.96	(3.56)	0.000	-64 -30 -22
			0.938	3.89	(3.50)	0.000	-58 -46 -22
			0.977	3.74	(3.39)	0.000	-50 -60 42
			0.987	3.66	(3.33)	0.000	-42 -62 44
			0.998	3.50	(3.21)	0.001	-52 -62 28
			1.000	3.03	(2.83)	0.002	-56 -46 36
			1.000	3.01	(2.81)	0.002	-54 -68 16
			1.000	2.99	(2.79)	0.003	-62 -24 -8
			1.000	2.83	(2.66)	0.004	-62 -18 -24
			1.000	2.76	(2.60)	0.005	-32 -56 40

FIG. 4

Increases in MCI





SPMresults: Results_122802_MCIvsOldctrls
Height threshold T = 3.00
Extent threshold k = 100 voxels

Statistics: *volume summary (p-values corrected for entire volume)*

set-level		cluster-level			voxel-level				x,y,z (mm)		
p	c	$p_{corrected}$	k_E	$p_{uncorrected}$	$p_{corrected}$	T	(Z)	$p_{uncorrected}$			
0.003	6	0.002	745	0.000	0.027	5.86	(4.82)	0.000	-16	-24	52
					0.528	4.48	(3.93)	0.000	-26	-26	66
					0.773	4.18	(3.71)	0.000	-6	-34	62
		0.318	188	0.026	0.120	5.23	(4.43)	0.000	26	-54	64
		0.003	678	0.000	0.202	5.00	(4.28)	0.000	10	-22	-30
					0.622	4.37	(3.85)	0.000	14	-38	-34
					0.925	3.92	(3.52)	0.000	-6	-28	-24
		0.001	873	0.000	0.379	4.68	(4.07)	0.000	34	-16	68
					0.434	4.60	(4.02)	0.000	26	-32	52
					0.596	4.40	(3.87)	0.000	14	-38	68
		0.530	138	0.051	0.837	4.08	(3.65)	0.000	62	12	36
					0.937	3.89	(3.50)	0.000	62	0	22
					0.994	3.59	(3.28)	0.001	62	0	34
		0.683	110	0.077	0.995	3.57	(3.26)	0.001	-6	-54	-16
					1.000	3.30	(3.05)	0.001	4	-50	-6

table shows at most local maxima > 8.0mm apart per cluster

Height threshold: T = 3.00, p = 0.003 (1.000 corrected)
Extent threshold: k = 100 voxels, p = 0.090 (0.739 corrected)
Expected voxels per cluster, <k> = 35.683
Expected number of clusters, <c> = 1.34

Degrees of freedom = [1.0, 33.0]
Smoothness FWHM = 13.5 13.7 16.0 (mm) = 6.7 6.9 8.0 (voxels)
Search volume: S = 1815544 mm^3 = 226943 voxels = 559.8 resels
Voxel size: [2.0, 2.0, 2.0] mm (1 resel = 370.95 voxels)

Fig. 5

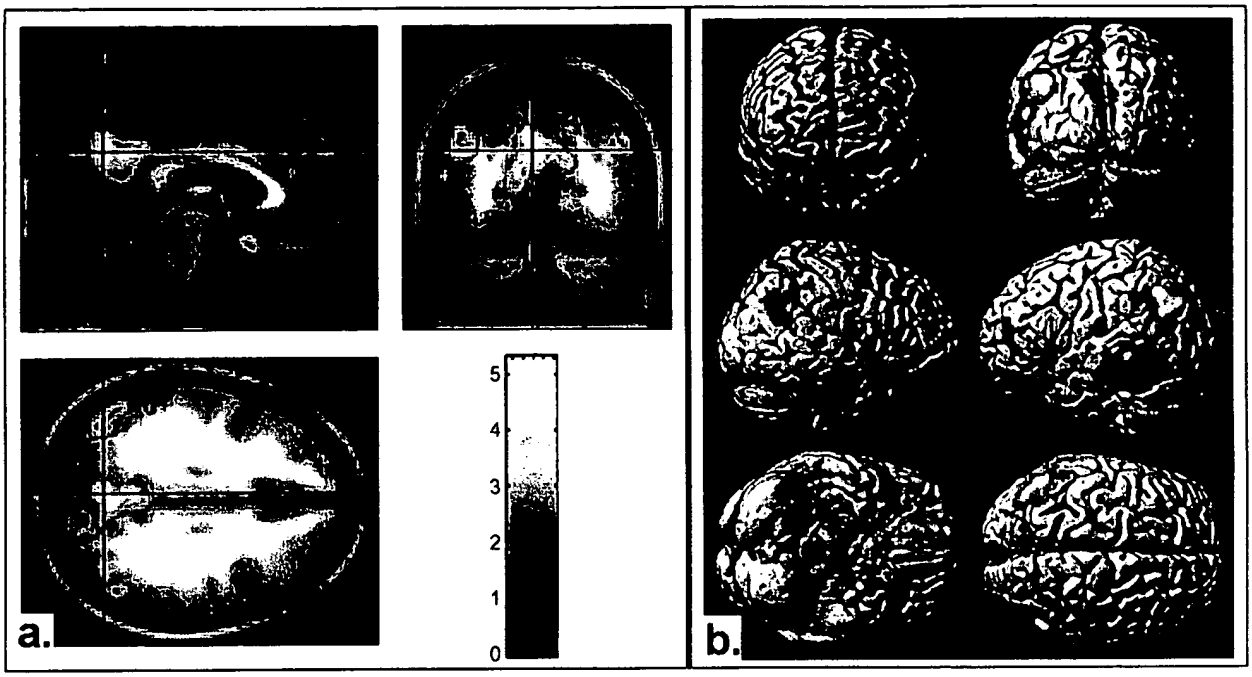


Fig. 6

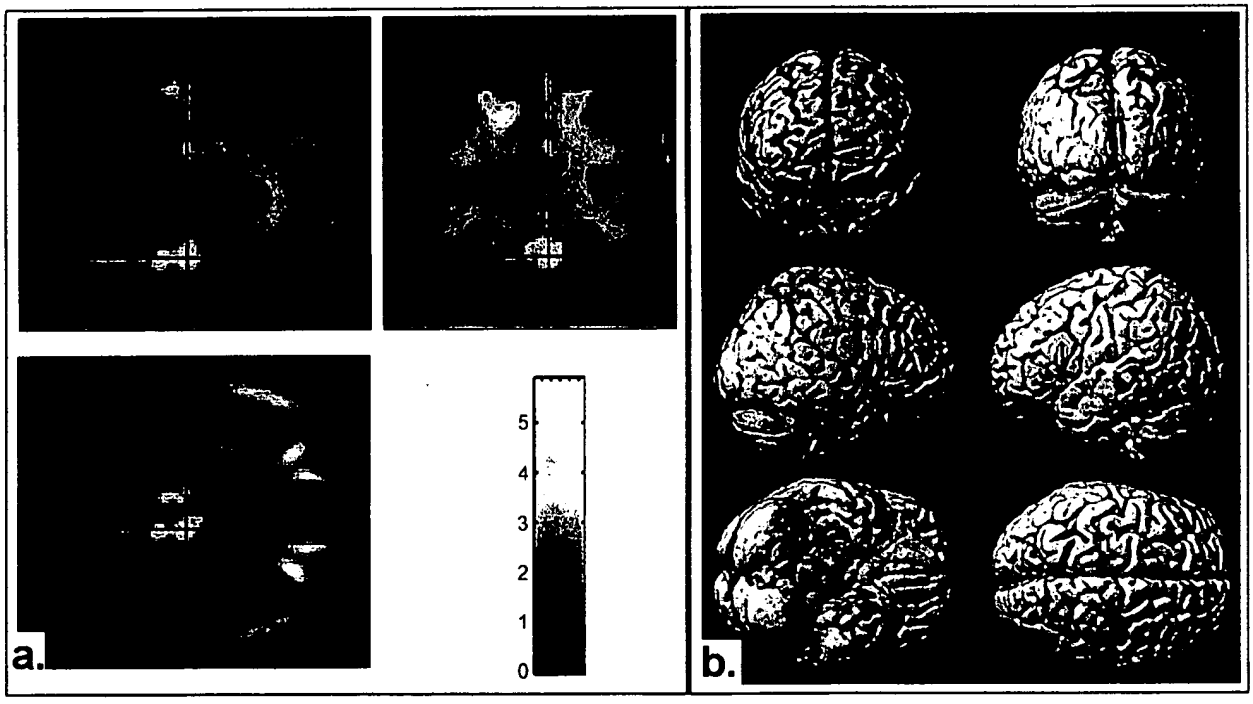


Fig. 7

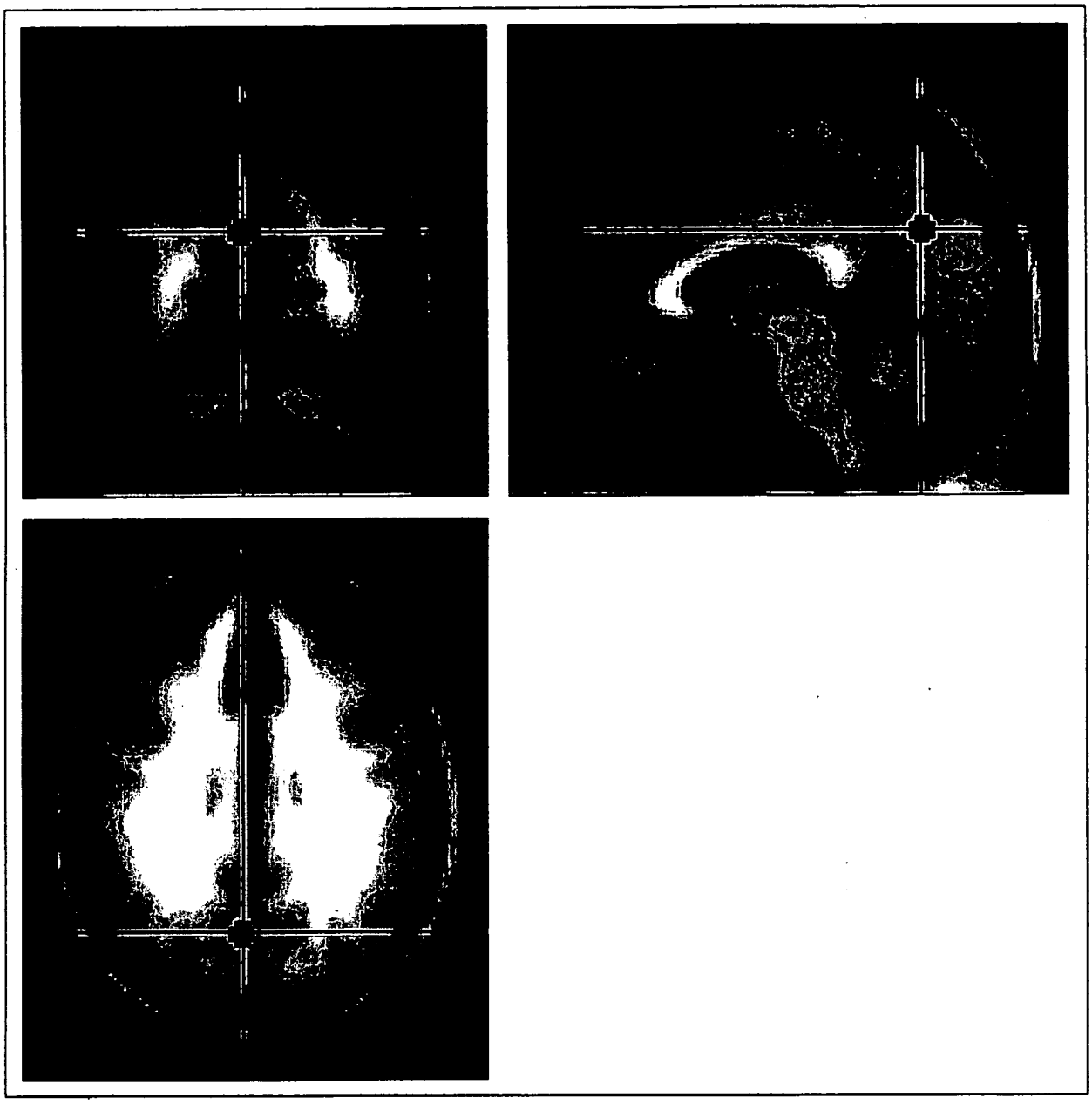


Fig. 8

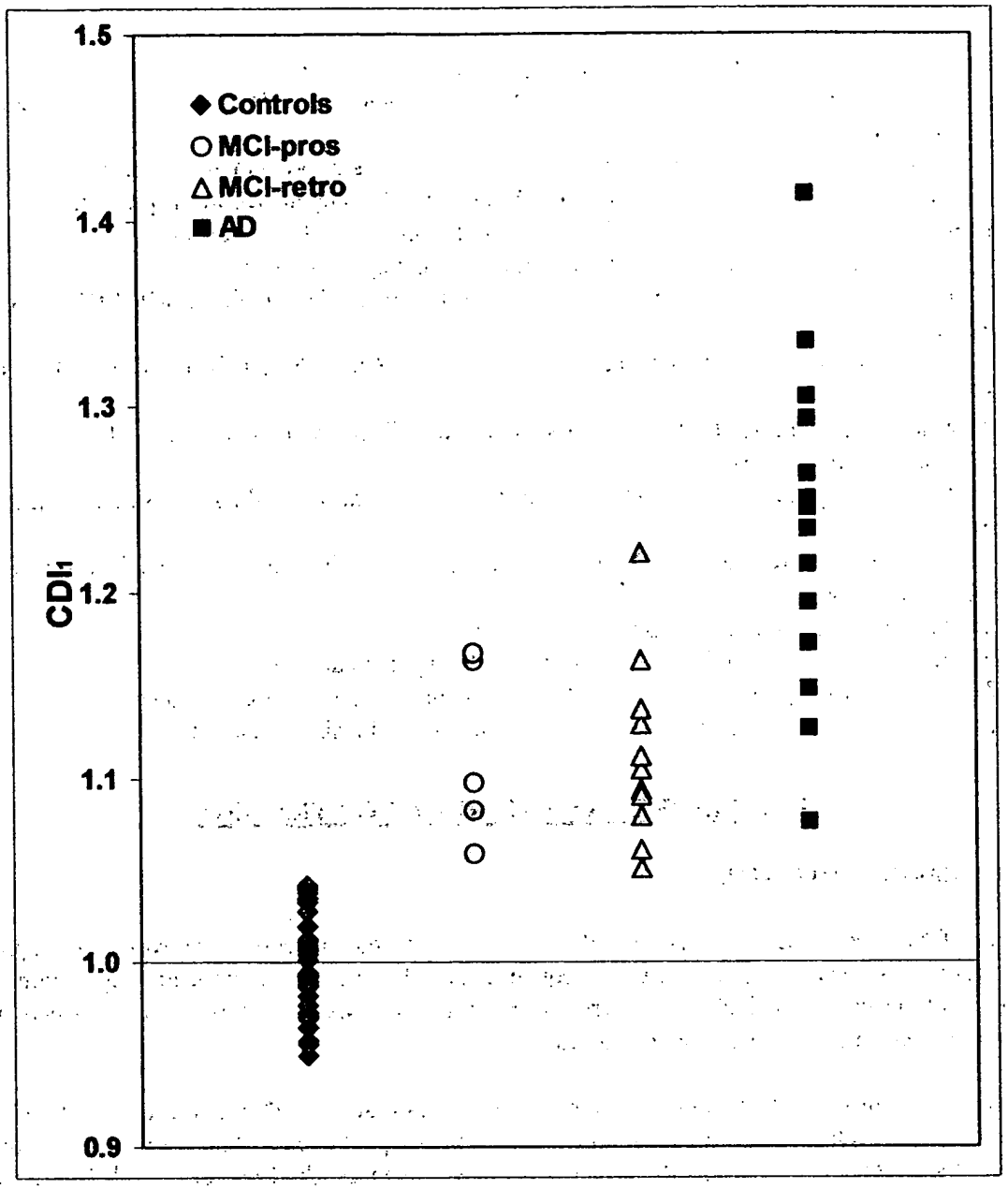


FIG. 9

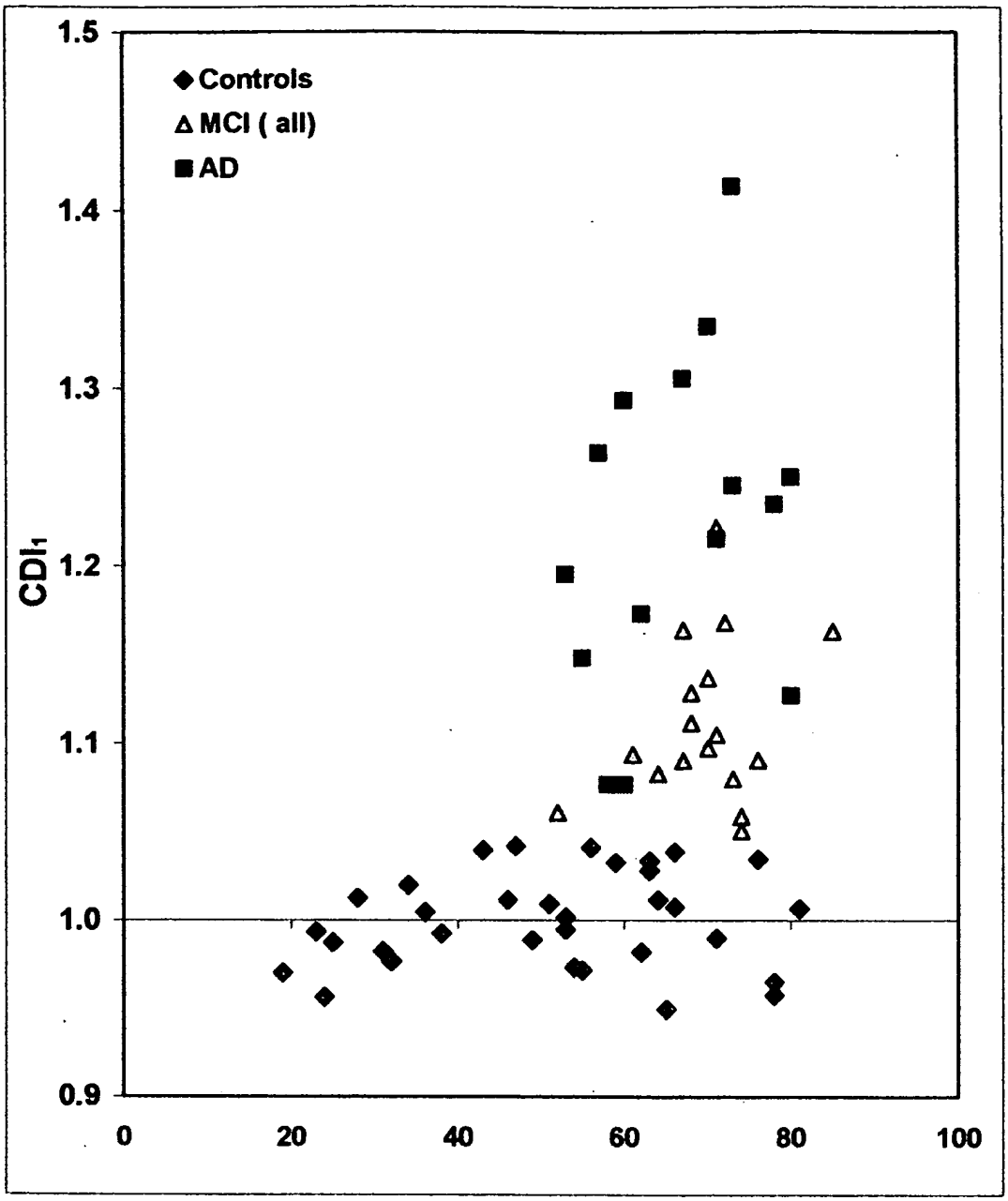


FIG. 10

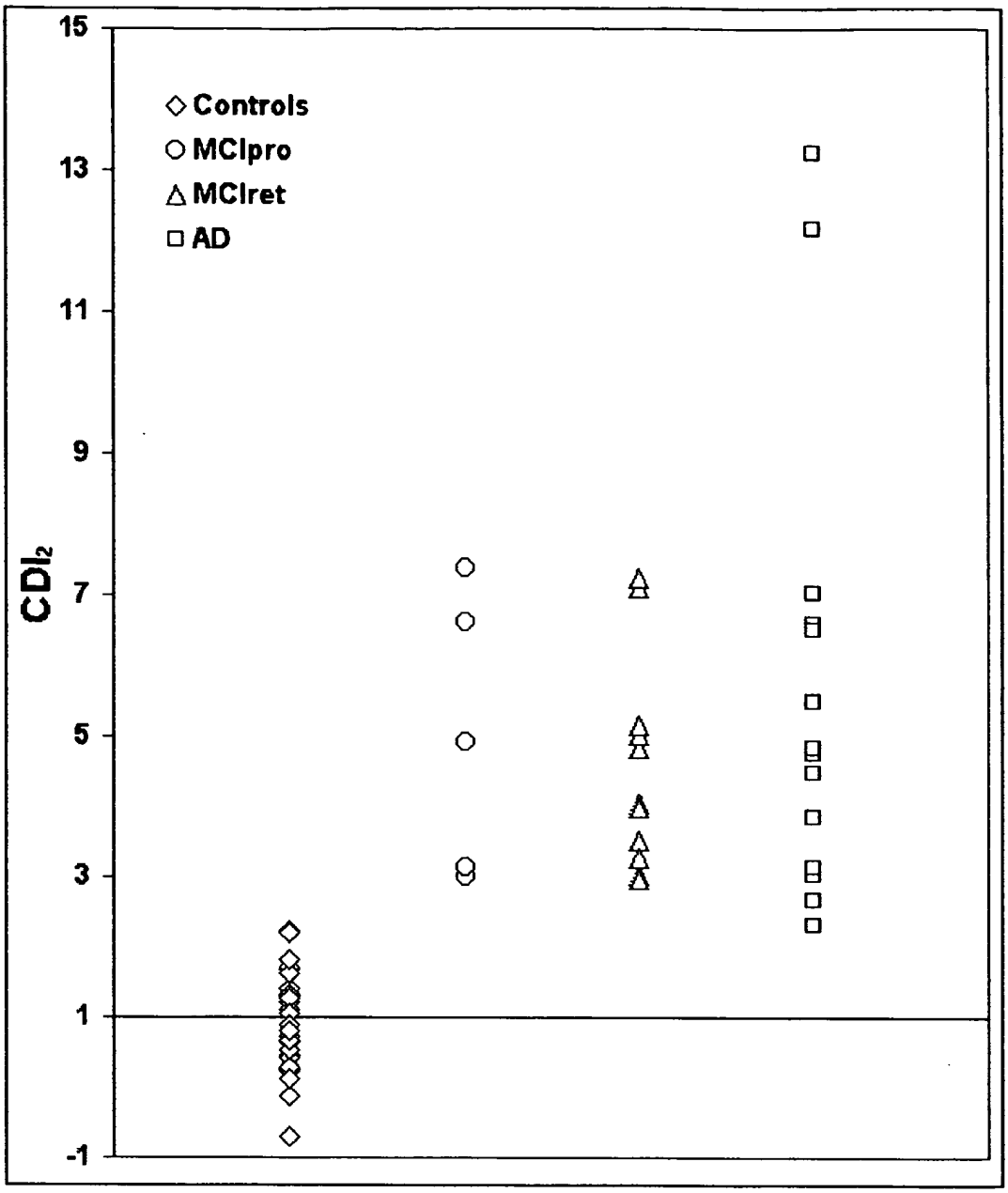


FIG. 11

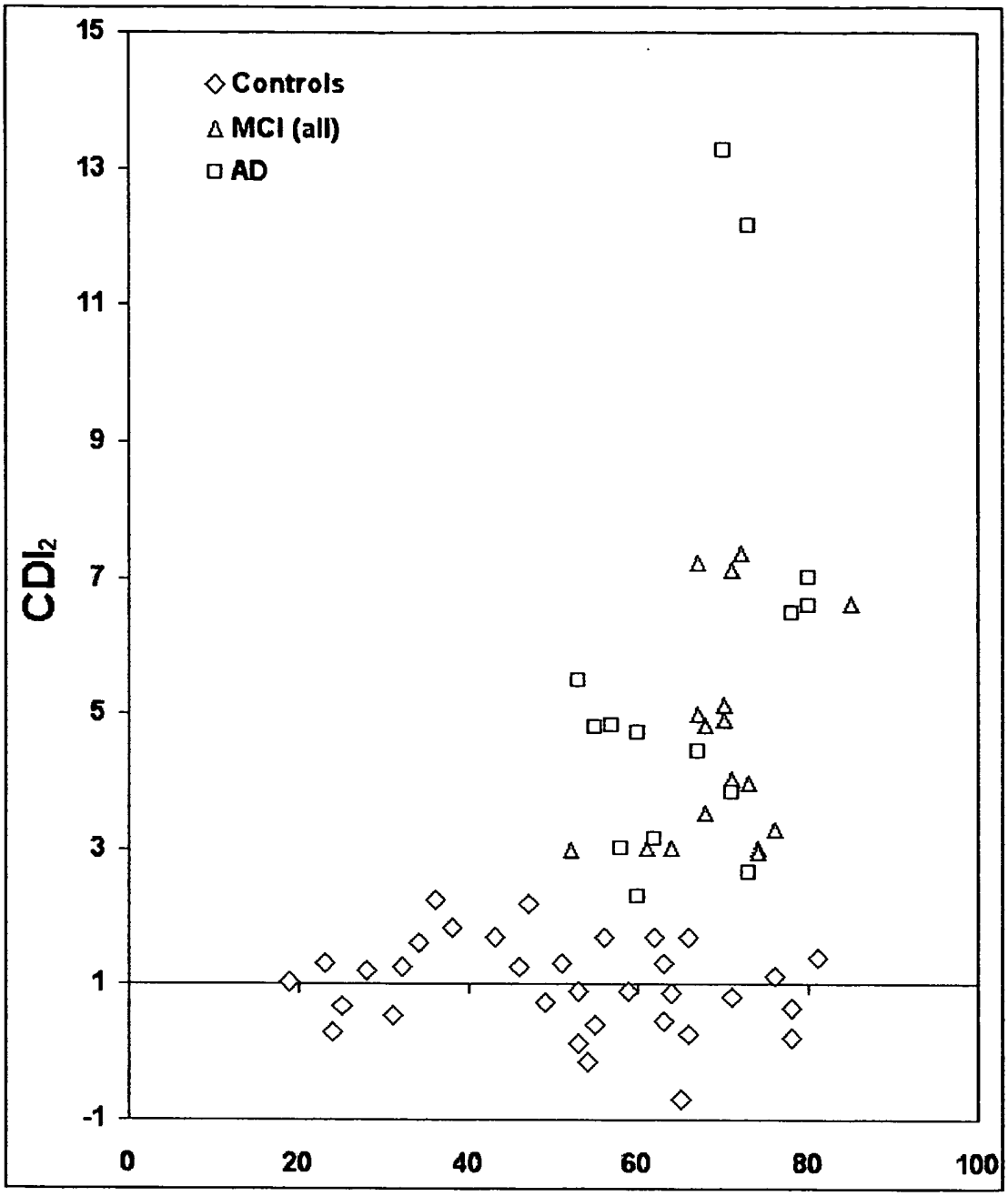


FIG. 12